Hydrodynamic Modelling and Quantification of Available Habitat in Constructed Wetland Wildlife Reserves

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A recent trend in infrastructure development for mitigating wetland loss, is to re-establish wildlife reserves in waterways that have been anthropocentrically modified. Due to the constructed nature of these reserves, the hydrodynamics need to be evaluated to determine their effectiveness. One method is to develop a computational mathematical model to simulate water flow throughout a reserve. The Danish Hydraulic Institute's Mike 21 numerical model is utilized to examine the tidal dynamics of the recently constructed Charlesworth Salt Marsh Reserve in Christchurch, New Zealand. Field data of bathymetry, velocity, water depth, time inundated, salinity and turbidity are used to develop and calibrate the model and effectively simulate water flow throughout the reserve. ESRI's ArcGIS is then used to integrate the data and quantify the amount of habitat created in the Reserve.

Case scenario model simulations of physical modifications including changes in vegetation, the reconstruction of the Humphrey's Drive embankment which separates the Reserve from the Avon Heathcote Estuary, the installation of additional water transfer structures (culverts) between the Reserve and Estuary, the effect of storm surges and sea level rise are evaluated. The results of this study will enable the Reserve's stakeholders to determine the current amount of habitat available as well as determine preferred hydraulic characteristics required for future enhancements of the Reserve and construction of other ecological reserves.